

Dodge B2500

Dedicated CNG Van



The U.S. Department of Energy (DOE) is promoting the use of alternative fuels and alternative fuel vehicles (AFVs). To support this activity, DOE has directed the National Renewable Energy Laboratory (NREL) to conduct projects to evaluate the performance and acceptability of light-duty AFVs. We tested a 1999 B2500 dedicated CNG Ram wagon with a 5.2L V8 engine. The vehicle was run through a series of tests, explained briefly below. The procedures are described in detail on the vehicle evaluation Web site at http://www.ott.doe.gov/otu/field_ops/nve

Acceleration: Three tests performed: (1) elapsed time from a standstill to 60 mph at wide open throttle, loaded and unloaded; (2) elapsed time from 40 to 60 mph at wide open throttle (passing simulation); (3) elapsed time and maximum speed at a quarter mile. Values are the average of six measurements.

Braking: Dry surface is concrete, wet surface is low friction jennite pad. Minimum stopping distance from 62 mph (100 km/h) on dry surface, and from 31 mph (50 km/h) on wet surface with no wheels locked. Panic stops are minimum measured distance from 31 mph (50 km/h) on wet and dry surfaces at maximum pedal pressure with no attempt to steer. Values are average of six stops.

Fuel Economy: City fuel economy determined using an urban driving cycle—a distance of 2 miles with 8 stops. Highway fuel economy used a 70 mph average driving cycle with no stops. The 150 mile trip alternated between urban and highway cycles until 150 miles were reached. Results are reported in 70% highway driving for total trip.

Cold Start: Vehicle placed in a temperature-controlled room at -20°F for first test (minimum soak time 12 hr*). Crank time and idle rating recorded. If start successful, procedure repeated at -20°F for confirmation. If start unsuccessful, procedure repeated at higher temperature until minimum temperature is determined.

Driveability and Handling: Four different drivers rated each aspect of the vehicles; final rating is average of the four.

Emissions: Duplicate tests performed on the vehicle using EPA's Federal Test Procedure. The vehicle was tested on compressed natural gas (CNG).

* Soak time allows the vehicle to stabilize at a given temperature.

For the 1999 model year, Dodge offered its popular Ram van/wagon with an optional natural gas engine. With this vehicle, Dodge marked its return to the natural gas market after stopping production of natural gas vehicles in 1996. From 1996 to 1999, Dodge evaluated new manufacturing techniques, as well as storage and emissions reduction technologies. Dodge's original CNG van, introduced in 1993, was the first full-size van to meet low-emission vehicle (LEV) standards. The 1999 CNG van was designed to meet California's super-ultra low emission vehicle (SULEV) standards. Most of the improvements for this model were in the fuel storage and delivery systems. Four carbon-fiber-wrapped steel tanks give a total of 18.7 gasoline gallon equivalent at 3600 pounds per square inch—a 46% improvement over the previous model. This gives the van a range of 200–300 miles per fill. And because the CNG tanks are located under the body of the van, no cargo or passenger space is sacrificed. Other improvements include using hardened materials in the engine for increased durability, a special natural gas catalyst, and a fuel shut-off solenoid to minimize evaporative emissions coming from the engine when it is turned off. To meet a fleet's individual needs, the CNG Ram van/wagon is available in 2500 or 3500 models, and in two body lengths.

Note that test planning for this vehicle did not include side-by-side testing with a gasoline control model because of project funding constraints. DaimlerChrysler provided the gasoline test values listed here for comparison.

General Description

	CNG B2500	Gasoline B2500†
Engine:		
Displacement	5.2 liter	5.2 liter
Configuration	V8	V8
Transmission	4-speed automatic OD	4-speed automatic OD
Fuel System	Sequential multi-port FI	Sequential multi-port FI
Engine Family Code	XCRXT05.26RC	XCRXT05.96B1
Compression Ratio	9.1:1	9.1:1
Capacities:		
Fuel	18.7 equivalent gal	36 gal
Passengers	2 front/6 rear	2 front/6 rear
Payload (lb)	2642	2990
Dimensions:		
Length	210.6 in.	210.6 in.
Width	78.8 in.	78.8 in.
GVWR	7700 lb	7700 lb

Other options:

Rear wheel drive, 8-passenger wagon equipped with air conditioning, power steering, power brakes, power door locks and windows, tilt wheel, antilock brake system (ABS), and cruise control.

† not tested - for comparison only

Performance

Acceleration

	CNG	Gasoline†
0 to 60 mph loaded (sec)	17.66	-
0 to 60 mph unloaded (sec)	13.5	10.2
40 to 60 mph (sec)	7.31	4.9
1/4 mile time (sec)	19.56	17.9
1/4 mile speed (mph)	71.73	77.8

Fuel Economy (mpg)

	CNG	Gasoline†
City	10.6	11.8
Highway	14.2	14.9
Combined City/Highway	13.0	-

† not tested - for comparison only

Braking

	CNG	
	meters	feet
Effectiveness stops:		
62 mph (100 kph) dry pavement	61.1	200.4
31 mph (50 kph) wet jennite	33.3	109.1
Panic stop		
31 mph (50 kph) dry pavement	16.1	52.7
31 mph (50 kph) wet jennite	34.0	111.5

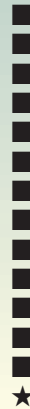
Cold Start

Temperature °F	crank time	idle rating
-20	Did not start	-
-10	Did not start	-
-5	12	6

Subjective Ratings:

Routine handling
Emergency handling
Acceleration
Braking
Ride; fully loaded
Ride; lightly loaded
Noise
Driving position
Front seat comfort
Rear seat comfort
Climate control
Access
Controls & displays
Cargo Area

CNG



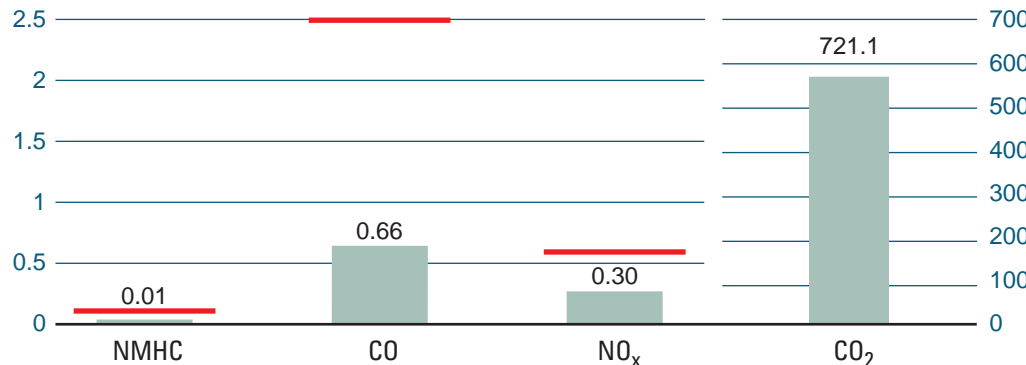
★ = Excellent ■ = Good ● = Fair ○ = Poor □ = Very Poor

Emissions

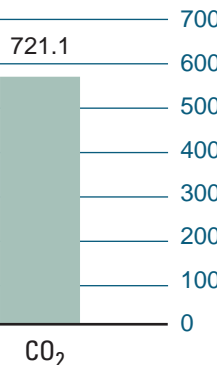
■ CNG

— ULEV

Regulated Exhaust Emissions (g/mi)



CO₂ Emissions (g/mi)



Evaluation Summary

The CNG Dodge Ram was the last in a series of alternative fuel vehicles tested under this project. Test planning for this vehicle did not include side-by-side testing with a gasoline control model. DaimlerChrysler provided the gasoline test values listed here for comparison. Evaluators in the driveability and handling test gave high marks to this van in all categories. Drivers reported good stability during panic stops and the ABS prevented wheel lock-up in all stops. Acceleration was rated good, but several evaluators noticed a lack of power during wide-open-throttle accelerations. Fuel economy results show that the CNG van gets 10.6 mpg in the city and a little over 14 mpg on the highway. For comparison, the gasoline Ram van has an EPA mileage rating of 13 city/18 highway. In the cold start tests, the CNG Ram van did not start at -20° F, but did start successfully at -5° F, with a crank time of only 12 sec. Although our test vehicle did not start at -10° F, DaimlerChrysler representatives report no problems starting at -10° F in their testing of CNG vans.

Although the gasoline version of this van is certified to EPA Tier 1 levels, the dedicated CNG Ram van is certified to federal ULEV standards (red lines on the graph above). Non-methane hydrocarbons, carbon monoxide, and oxides of nitrogen emissions are all well below this standard. Emissions of total potency weighted toxics (PWT) (including benzene, 1,3-butadiene, formaldehyde, and acetaldehyde)* for the CNG van were very low (0.08). This is more than 90% lower than the PWT of previously tested gasoline Ram vans and 19% less than the previous model dedicated CNG Ram van.**

* For more information on the calculation of PWT emissions, see the section on emissions on the Web site (www.ott.doe.gov/otu/field_ops/nve).

** The 1994 dedicated CNG and gasoline Dodge Ram vans were tested in an earlier project. For detailed emissions results from this study, go to the Web site: http://www.ott.doe.gov/otu/field_ops/emiss_data.html